Cricket Paralysis Virus Threatens Cricket Farm Business

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Abstract

Crickets are a vital source of protein for many human and animals such as frogs, geckos, lizards and are starting to make a debut as an ingredient in dog food. When crickets are consumed it is vital the crickets are free of disease (Dunn). One disease that crickets are susceptible to is the cricket paralysis virus. Cricket paralysis virus (CPV) can "infect several insect orders such as *Diptera*, *Lepidoptera*, *Orthoptera*, *Hemiptera* and *Hymenoptera*, as well as a diverse range of cultured insect cells"(King). The cricket paralysis virus belongs to the family of viruses classified as Dicistroviridae. Dicistroviridae viruses can be characterized as "small enveloped viruses with monopartite, linear, and positive sense RNA genomes"(Valles). A collection of cricket samples from a cricket farm was sent to the lab to be tested for the cricket paralysis virus. If the crickets test positive for the cricket paralysis virus then the cricket farm may be forced to shut down. However, the results of the experiment were negative for the virus. These results are crucial because they impact the people or animals that consume these crickets, the fate of the business that produces the crickets, and contributes to more experiments related to the cricket paralysis virus.

Purpose

The purpose of this research is to determine whether the cricket samples presented are infected with the Cricket Paralysis Virus.

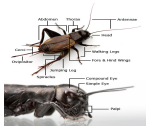
Questions, Hypotheses, and Predictions

Question: Will the results of the experiment be positive or negative when searching for the cricket paralysis virus within the samples?

Hypothesis: If the crickets test positive for the cricket paralysis virus then the cricket farm may be forced to shut down.

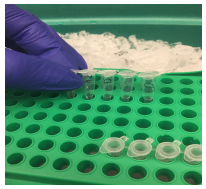
Study System

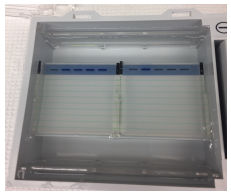
The organism being studied is the cricket. Crickets belong to the order Orthoptera and the family Gryllidae. A cricket is divided into three parts, head, thorax and abdomen. Palpi, which is located on the head of the cricket is used for sensing and clutching food. Crickets are equipped with jumping legs to assist in launching them substantial distance and are located on the thorax. Spiracles can be found on the abdomen of the cricket. The purpose of spiracles is deliver oxygen throughout the body.



Methods and Experimental Design

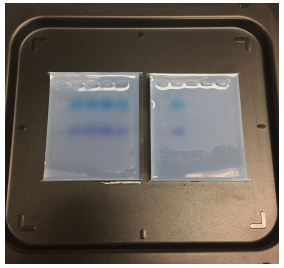
There were several steps involved in to determine whether the crickets were affected by the virus. There were three samples that went through each process, two crickets that had been alive and one that was dead. For the first part of the experiment the RNA, DNA and proteins need to be isolated. The first step in this process was to precipitate the RNA by adding isopropanol and centrifuging the sample. Next the RNA had to be washed using 75% ethanol and then had to be vortexed. Finally the RNA had to be solubilized and a yield determined. After that the DNA had to be precipitated, washed, solubilized and a yield calculated. The same process was used to isolate the proteins as well. The second part of the experiment consisted of synthesis of the first strand cDNA and the PCR reaction.

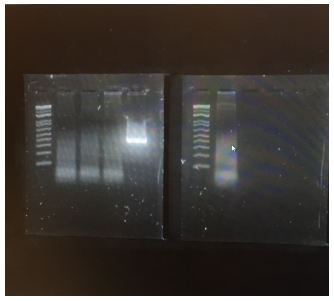




Results

The result of the experiment is the crickets tested negative for the cricket paralysis virus. The pictures below demonstrate the electrophoreses gels that were run to determine if the virus was present. The picture on the left is of the gels when they are not being viewed under UV light. The picture on the right is a more clear image of the gels as they appear while in the machine. This image shows the three samples and does not show the band in any of the samples of the target gene. The size of the target gene was 350 bp. The first column in the first gel is the DNA ladder. The last column in the first gel is the positive control. The machine used to view these gels is know as the gel dock. The second gel in the picture on the right is only water which is negative. Both gels were formed using 2% agarose gel.





Conclusions

Based on the results of the experiment it can be inferred that the crickets did not possess the virus. These results are important because it influences the next step for the cricket farm, allowing them to move forward with their business. If the crickets had been infected with the cricket paralysis virus the cricket farm would no longer be able to operate. When it pertains to the animal science standpoint these results are significant because it can lead to future research on the effects of the virus on a higher level on the food chain.

Future Directions

The next step in this process should be to figure out the consequences when a larger species such as a frog consumes crickets containing the virus and how it affects the next line of the food chain. To conduct this experiment a population of infected crickets would be needed and then monitor the effects that the crickets have on the subjects ingesting them. If I were to rerun this experiment, I would complete multiple trials to ensure that the crickets were not infected with the virus. Since the crickets did not possess the virus it would be interesting to discover what was causing the crickets to act the way they were.

References

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